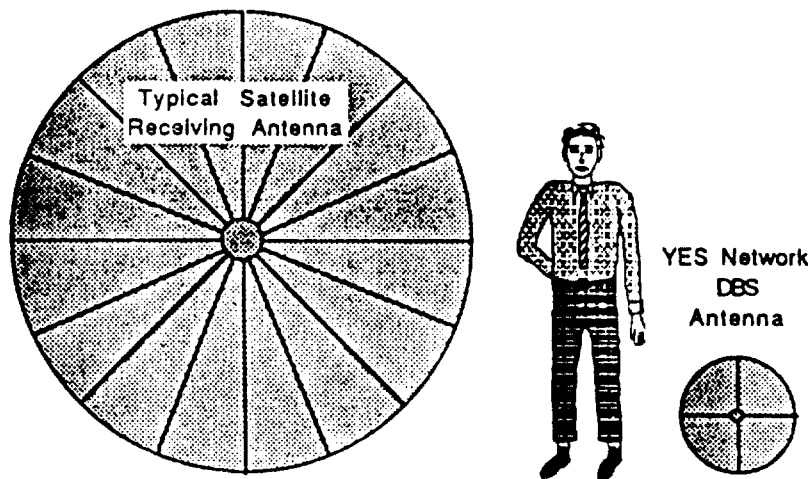


**Innovative Education Today:** There are two significant trends in today's education. One is the innovative and very effective use of computers and laserdisks at all levels of education. When used properly, computers and computer-controlled laserdisks can vastly enhance the student's learning experience, ease the teacher's workload, and provide totally new teaching and administrative tools. Unfortunately, there are too few classroom computers and even fewer teachers that are adequately trained in their usage.

The other trend is a rapid increase in "distance learning." This term covers everything from microwave remote-campus TV lectures to telephone lines carrying voice and electronic blackboards, or even electronic computer bulletin-boards for students to ask questions of their instructors. Several universities, some international groups, and many corporations are using satellites for very effective TV distance learning.

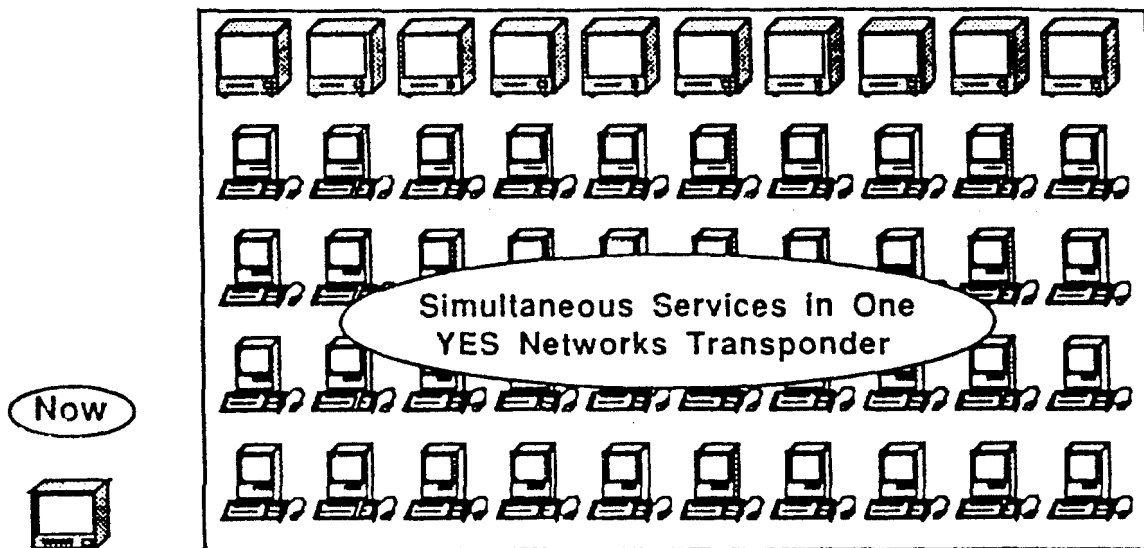
However, satellite systems today are very expensive, both for satellite transmission (transponder) time and for the ground receiving terminals which include a permanently mounted 8- to 12-foot dish. Recently, satellite distance learning has increased in the public school sector, especially prompted by last year's U.S. Dept. of Education "Star Schools" program. Existing systems, include Los Angeles County's Educational Telecommunications Network (ETN), a satellite system installed mainly for teacher training. Distance learning is effective and in many cases is the only means available to offer minimum required courses and/or optional advanced courses.



### **Present Antennas vs YES Networks DBS Antenna**

The YES Networks, our proposed system to establish new learning opportunities, will use digital DBS together with computer assistance techniques to allow simultaneous nationwide presentation of up to 100 or more formal courses to all of America's schools and homes —

each offering innovative educational services that are not possible by other means (e.g., traditional instructional television and computer networks) with each providing essential enrichment for rural and minority students.



A Comparison of Educational Services -- Present vs YES Networks

All this can occur in a single DBS satellite TV transmitter (transponder) which, using conventional techniques, could carry only a single video course. Reception will be by means of the same **inexpensive 2-foot antenna** used for DBS TV. Display will require a personal computer, HDTV, or TV adaptor. Optionally, distribution to additional projectors or monitors can be provided. Supplementary materials (e.g., reading, programmed learning assignments, homework, exams) will be "downloaded" to the students simultaneously during the broadcast lecture using the same channel and equipment.

This nationally-broadcast and widely-received system will serve as the obvious means to coordinate national educational enhancement programs such as that proposed by the NCTM<sup>1</sup> and other educational organizations. The best teachers in the nation can be used to reach an extremely large complement of students, while all teachers will have access to advanced learning materials for improved individual student attention.

One of the primary uses of the system will be **teacher training**. Teachers will have easy access to training in effective classroom computer usage and to a vast repertoire of science, mathematics and

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<sup>1</sup>"Curriculum and Evaluation Standards for School Mathematics", National Council of Teachers of Mathematics, October 1987.

other important courseware. The possible educational uses and benefits from this system are far too numerous to attempt to itemize herein, but a partial list is presented in Appendix A.

### **Window of Opportunity:**

For the first time in history, all of the required technology for implementing such a capable system is available. A timely opportunity such as this may come only once in the development of civilization. Even as we write, other countries (Japan, United Kingdom, Germany, France, and Luxembourg) that recognize the opportunities are moving forward with DBS TV services and HDTV to implement at least some portions of what we have described.

Establishment of a digital DBS TV, HDTV, and educational broadcasting system could put America again in the forefront of technology and provide the means to rapidly bootstrap our science, mathematics, engineering and other educational systems back to an enviable leadership position.

However, the time to develop this opportunity is relatively short. The word for the day regarding America's technology and leadership is "use it or lose it." We can use our existing technology to invest in future education, thus preserving our technology base and national security, or we will lose it, abdicating our leadership and abandoning our industrial capacity to foreign competition, which is more educated, aggressive, and aware.

This program ties together past and present national policy initiatives in education and public benefits with national technological capability and a poised regulatory stance of willing implementers that is truly unique. Action must be initiated immediately. This promise and opportunity offers the highest reward-to-risk ratio ever seen by the authors.

## **What is Committed:**

The Foundation, a 501(c)3 public charity, has assurances of the two transponders on-board ACC's FCC-approved DBS system beginning operation in 1992 through 2005 and beyond. In addition, the Foundation has identified the resources to place a free receiving antenna in each of America's public and private schools, libraries and hospitals. This combined commitment exceeds \$400 MM. The comparable cost using existing technology would be in the mid ten-figure range. Consequently, the Nation's advanced educational and informational hardware infrastructure will be in-place in the early 1990's using private resources (see Appendix B).

## **What is Needed:**

1. A modest U.S. Government contribution of \$15 MM to the Foundation to complete prototype digital receiving antennas, develop digital HDTV techniques, develop computer course(s). In addition, study reliable emergency broadcast system opportunities (see accompanying paper).
2. A Space System Development Agreement (SSDA) with NASA for launch services for ACC's two DBS satellites.

## **Appendix A**

### **Opportunities in Digital DBS and HDTV Systems**

**(YES Networks examples.)**

- Satellite educational programming to all public and private elementary and secondary schools and Universities in America;
- Undergraduate and Graduate education in businesses and homes;
- Inservice teacher training;
- Information data streams to all libraries in America;
- Educational programming to all child-care centers in America;
- Parent education in home or school;
- Specialized programs for disadvantaged, gifted, talented youth;
- Adult literacy;
- Student remedial programs;
- Senior citizen learning opportunities;
- Transmission of informational and innovative materials to schools, PTAs, school boards, administrators, teachers;
- Specialized programs for vocational-technical schools;
- Lifelong education, including graduate studies through the University of America;
- Education and data transmission to support migrant students;
- Improved, widely-accessible USDA market data information exchange;
- Medical training programs to hospitals and clinics;
- Medical information interchange among medical facilities;
- Assist prison inmates rehabilitation programs;
- Emergency Broadcast System;
- Professional requalification as required by state laws.
- Professional training and informational services (legal, accounting, financial, medical, engineering, etc.).

## **Appendix B**

### **Organizations Directly Involved**

**Foundation for Educational Advancement Today (FEAT or Foundation):** A 501(c)3 public charity formed to hold transponder (2) broadcasting rights on board ACC's DBS system, acquire and donate miniature digital receiving antennas for every public and private school and library in the U.S., and to assist the YES Networks in its programming activities in appropriate ways.

**Advanced Communications Corporation (ACC):** A Federal Communications Commission licensed DBS permittee with authority to construct, launch, and operate two high-powered 16 transponder satellites covering the U.S. ACC has contracted with the General Electric Company to construct these two satellites.

**Advanced Communications Engineering, Inc. (ACE):** An affiliate of ACC which is designing transmission and reception capabilities for digital TV, digital HDTV, and related educational initiatives among other services for broadcast through ACC's DBS system.

**YES Networks, Inc. (YES):** The operational and programming arm for the comprehensive educational and informational services.

### **Associated Individuals**

**Honorable Wilbur D. Mills:** Chairman and Trustee, FEAT; Chairman Emeritus, ACC; former Chairman, United States House of Representatives Committee on Ways and Means.

**Mr. Daniel H. Garner, Jr.:** President and Board Member, ACC; Board Member, ACE; Trustee, YES; former broadcasting and investment banking executive.

**Mr. James M. Beggs:** Chairman, ACE; Senior Advisor, ACC; former NASA Administrator; Chairman, Spacehab, Inc.

**Mr. Donald K. Dement:** Senior Vice President and Board Member, ACC; Vice Chairman, ACE; Senior Advisor, YES; former Director, NASA Communications Programs.

**Dr. G. Gordon Apple:** President, ACE; Vice President, ACC; Senior Advisor, YES; former TRW Senior Engineer and Bell Labs Engineer, Mgr. of digital HDTV project for CBS (1982-1983).

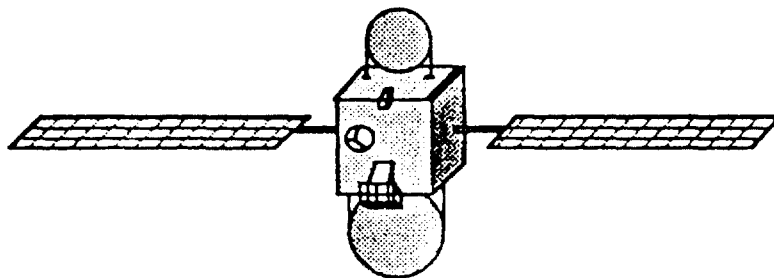
**Mr. Wayne Wells:** Treasurer and Trustee, FEAT; Senior Financial Advisor, ACC; former Treasurer and Board Member, General Dynamics Company.

**Mr. Jackson T. Stephens, Jr.:** Founding Board Member and Senior Financial Advisor, ACC; Senior Advisor, YES; CEO, Stephens Enterprises and related activities.

### **Professional Services**

**Legal:** Mr. Richard S. Rodin, Esq., Hogan and Hartson, Washington, D.C.

**Financial:** Mr. Jerry Walton, Managing Partner, KMG Peat Marwick, Little Rock, Arkansas.



## A Means to Augment America's Emergency Broadcast System

Prepared by Advanced Communications Corporation

for President George Bush

March 1989

## **Emergency Broadcast Services via Direct Broadcast Satellites**

**Introduction:** By 1992, high-power direct-broadcast satellites ("DBS") in orbital view of the United States will make possible television communication to very small receiving terminals intended for home entertainment use. However, use of the satellites under disaster or stress conditions to augment the present audio "Emergency Broadcast System ("EBS") could provide a new and uniquely effective national resource. Improving on present vulnerabilities of the EBS, the DBS satellites could be made reliable against orbital attack by protecting the electronics in the initial design. Advanced Communications Corporation, an FCC authorized DBS permittee, proposes to explore this concept in cooperation with the United States Government.

**The DBS System:** U.S. DBS satellites designed for entertainment may also be considered as high-power communications links for a variety of purposes -- specifically any that require low-cost, wideband, nationwide service -- and that the receiving antenna be small: under two feet in diameter. The terminals can be located anywhere in line-of-sight to the satellite, such as on rooftops or in windows, and can be made totally portable.

**Terminal Cost:** The home DBS terminal is predicted to cost less than \$400 at first, and later diminish to \$250. The several million Americans who have no access to television broadcasts or only poor reception are expected to find DBS attractive, and by 1996 sales are projected in the tens of millions.

**DBS for EBS:** The potential utility of these DBS systems extends far beyond entertainment, and these very pervasive in-place capabilities could be utilized as an augmentation to emergency networks. Temporary use in a crisis could uniquely supplement today's EBS services, providing vital visual, aural and printed messages; and to reach emergency workers' portable terminals with data and graphics, and vital representations such as signatures. Implementation could be followed in the same manner as founding of the EBS network: temporary use of a privately-owned transmission system reaching large numbers of small terminals already in users' possession.

**An Independent Augmentation:** Whether threats are natural disasters or national crises, independence from damaged local transmitters could be essential to national, state or local needs. Satellite uplink broadcasting center, or auxiliary centers, can be located out of harm's way anywhere in or out of the country while in line-of-sight to the satellite.

**Protection:** Although the satellites hardly could be maneuvered from a direct orbital attack, they might be designed and built to survive an electromagnetic pulse ("EMP"), dependent upon the amount of "hardening" that is accomplished in the design. Emergency terminals also could be EMP protected if desired. If value is seen in extending the current audio-only EBS network to enable national and local authorities to reach millions of small terminals at low marginal cost, then very soon designs must be influenced to initiate a protection program.

**Summary:** It appears that a large increase in the functional capability of disaster communications could be provided via DBS. No transmission system has ever had the DBS systems' potential pervasiveness for such large amounts of information at low cost. Action to initiate a satellite and terminal protection capability should begin soon.



# **Digital DBS, Education and HDTV**

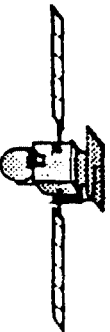
(Direct Broadcast Satellites; High Definition TV)

**Presentation to:**

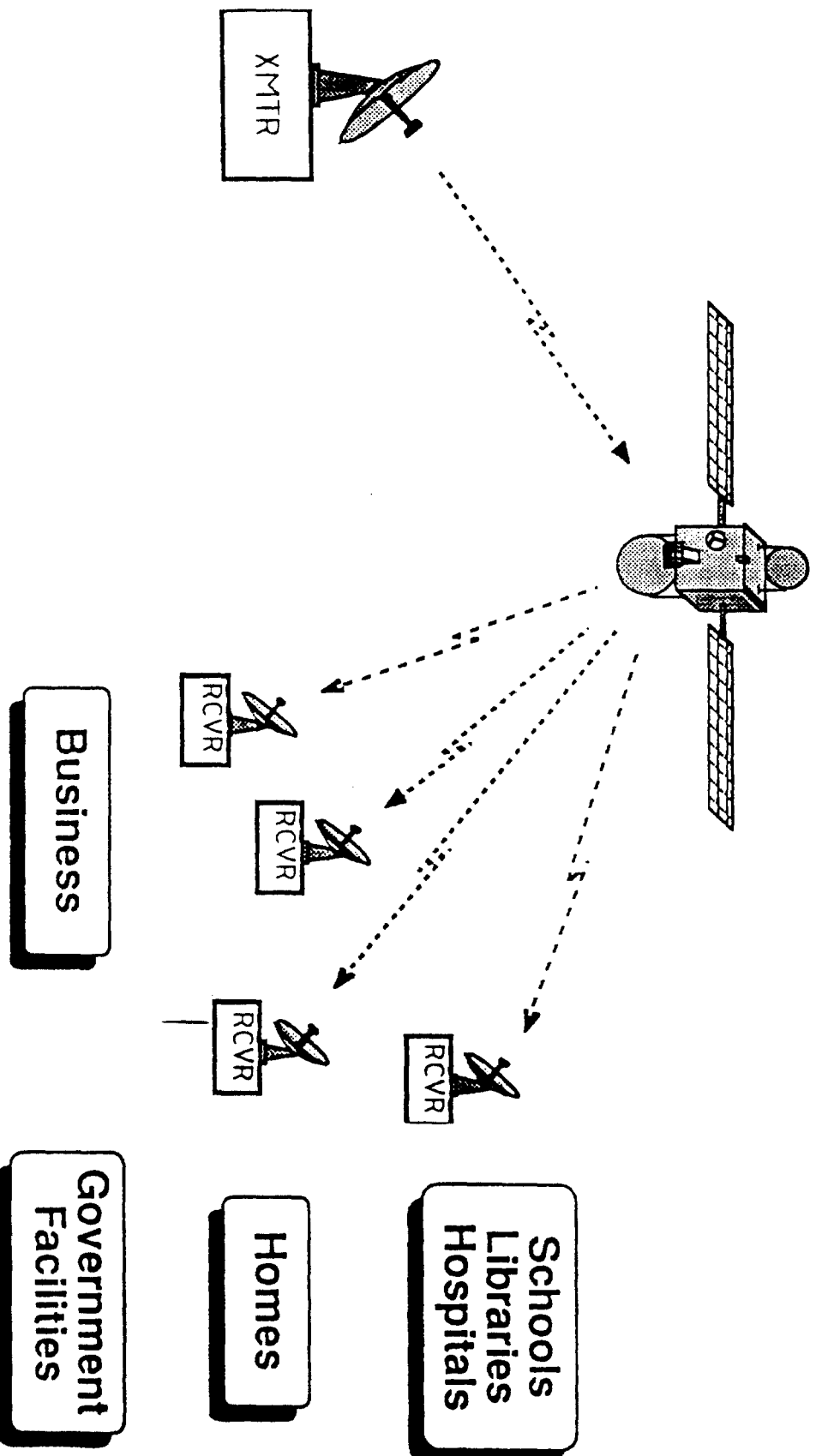
**President George Bush**

**June 23, 1989**

**Advanced Communications Engineering, Inc.**

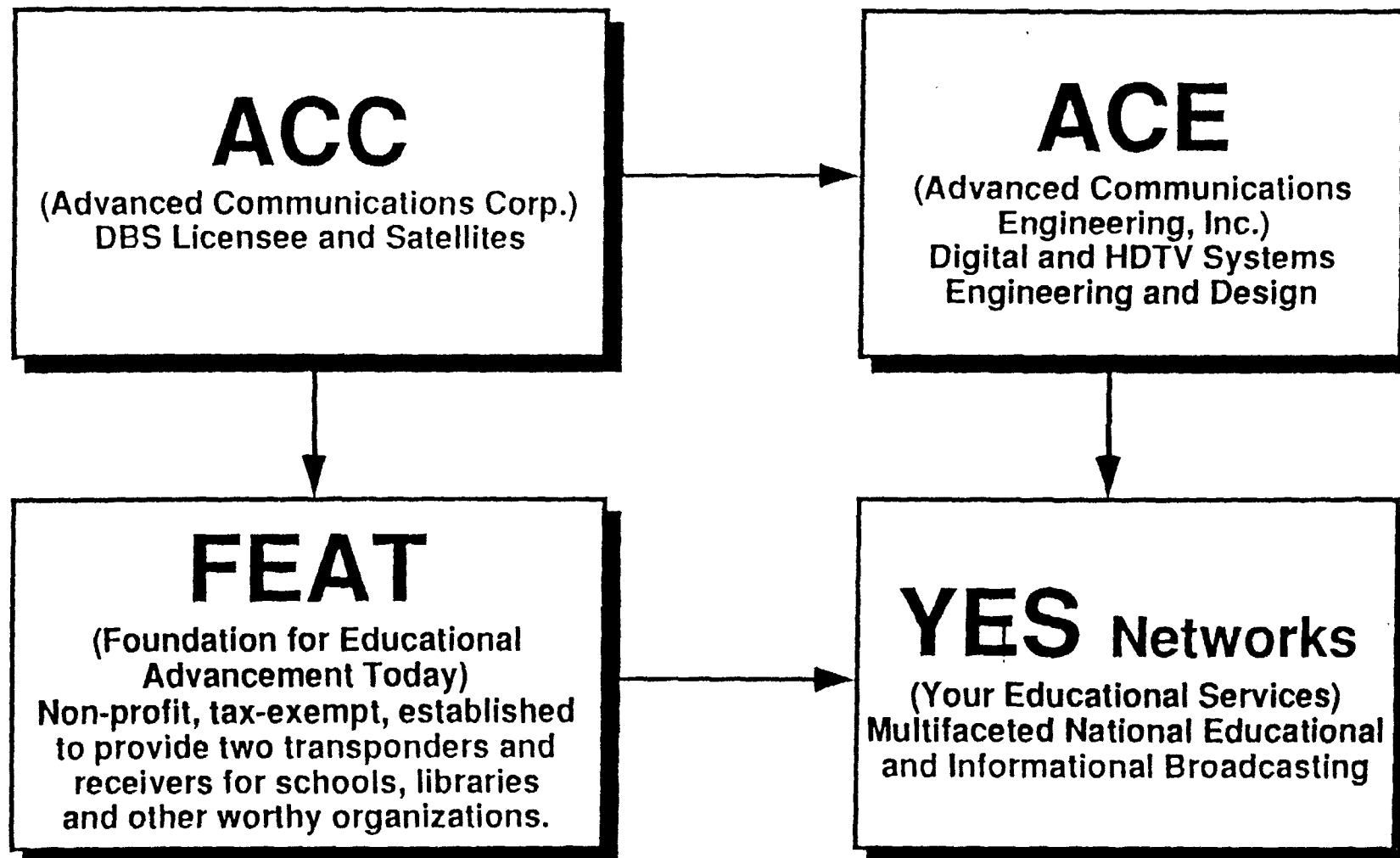


# Digital DBS





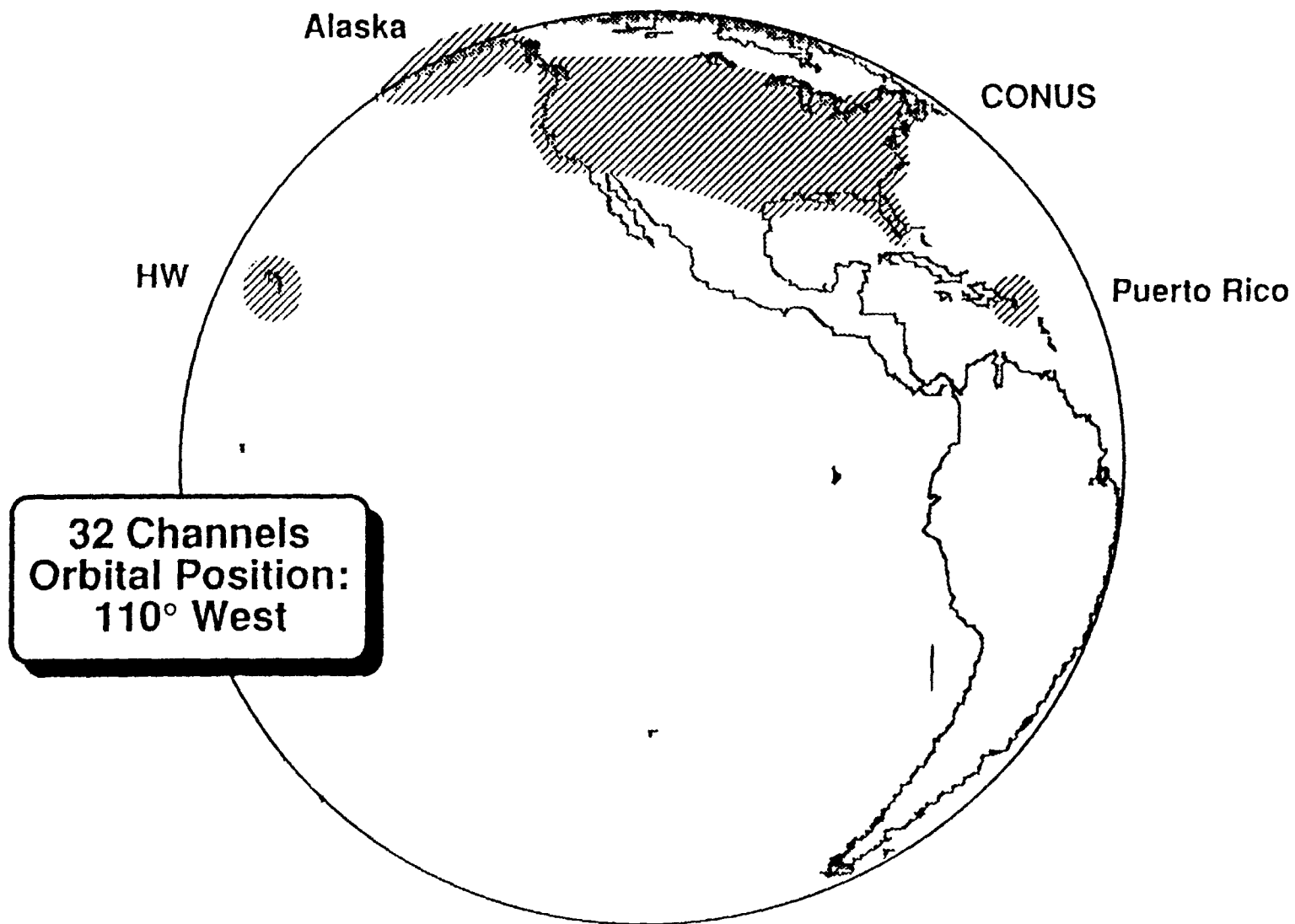
## Organizations Directly Involved



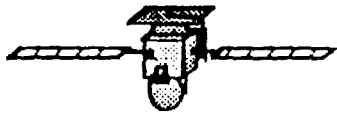
Advanced Communications Engineering, Inc.



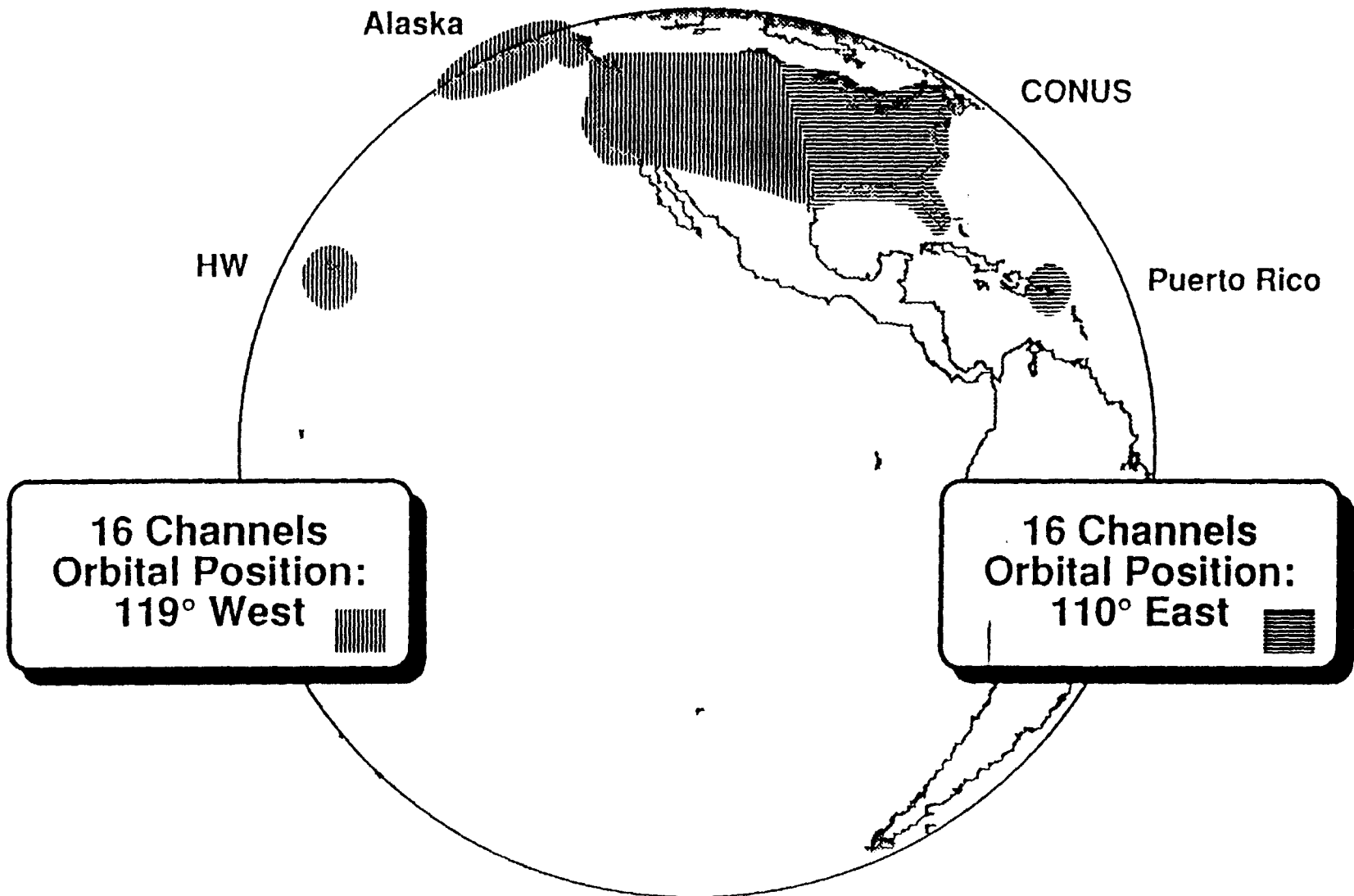
# Orbital View of Full Coverage Area



Advanced Communications Engineering, Inc.



# Orbital View of Half Coverage Areas

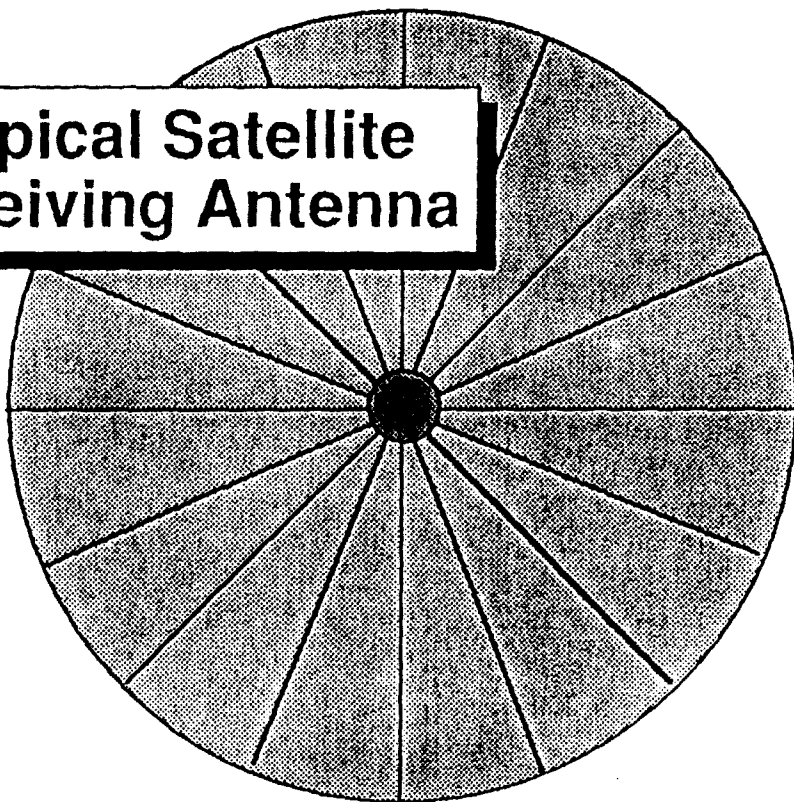


Advanced Communications Engineering, Inc.

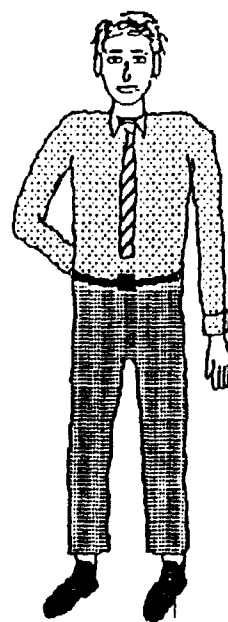


# Antenna Size Comparison

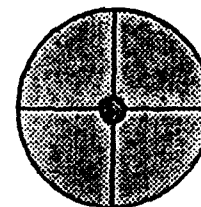
**Typical Satellite  
Receiving Antenna**



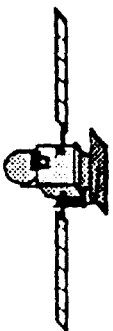
8' diameter. Requires pedestal, concrete pad, local zoning approval, and (sometimes) a fence.



**DBS  
Antenna**

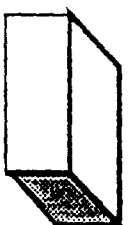
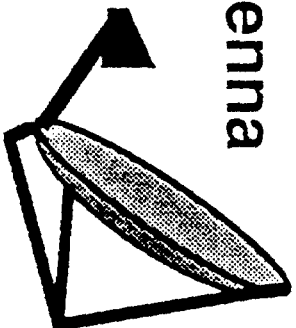


2' diameter. No pedestal or pad, local zoning preempted by FCC, installed by owner.

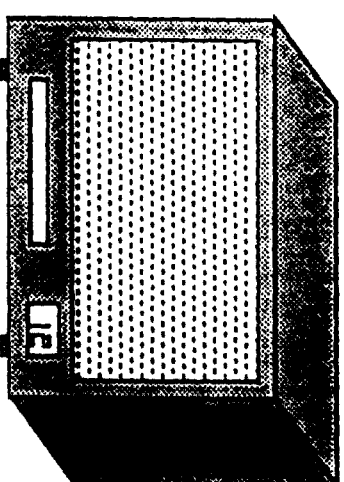


# Receivers

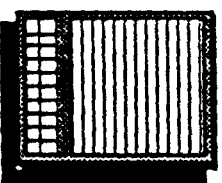
2' Antenna



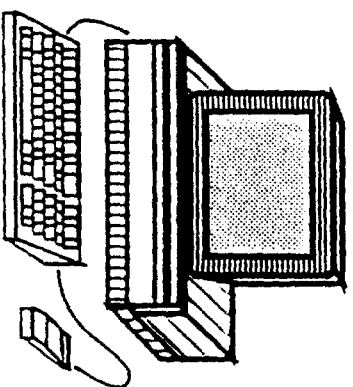
TV or HDTV



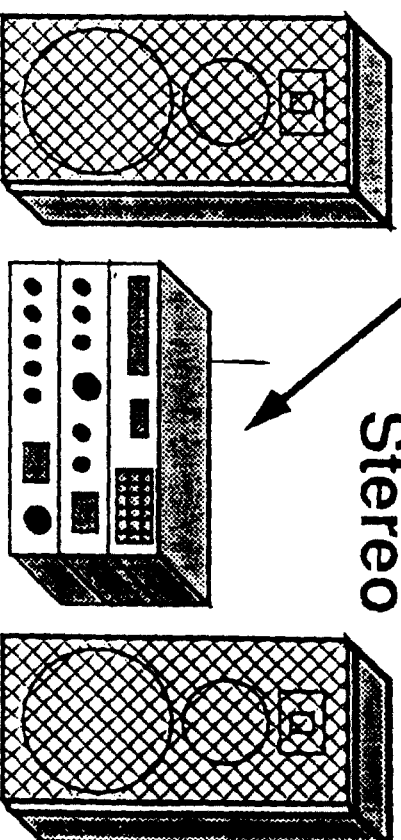
Elttron



Personal Computer

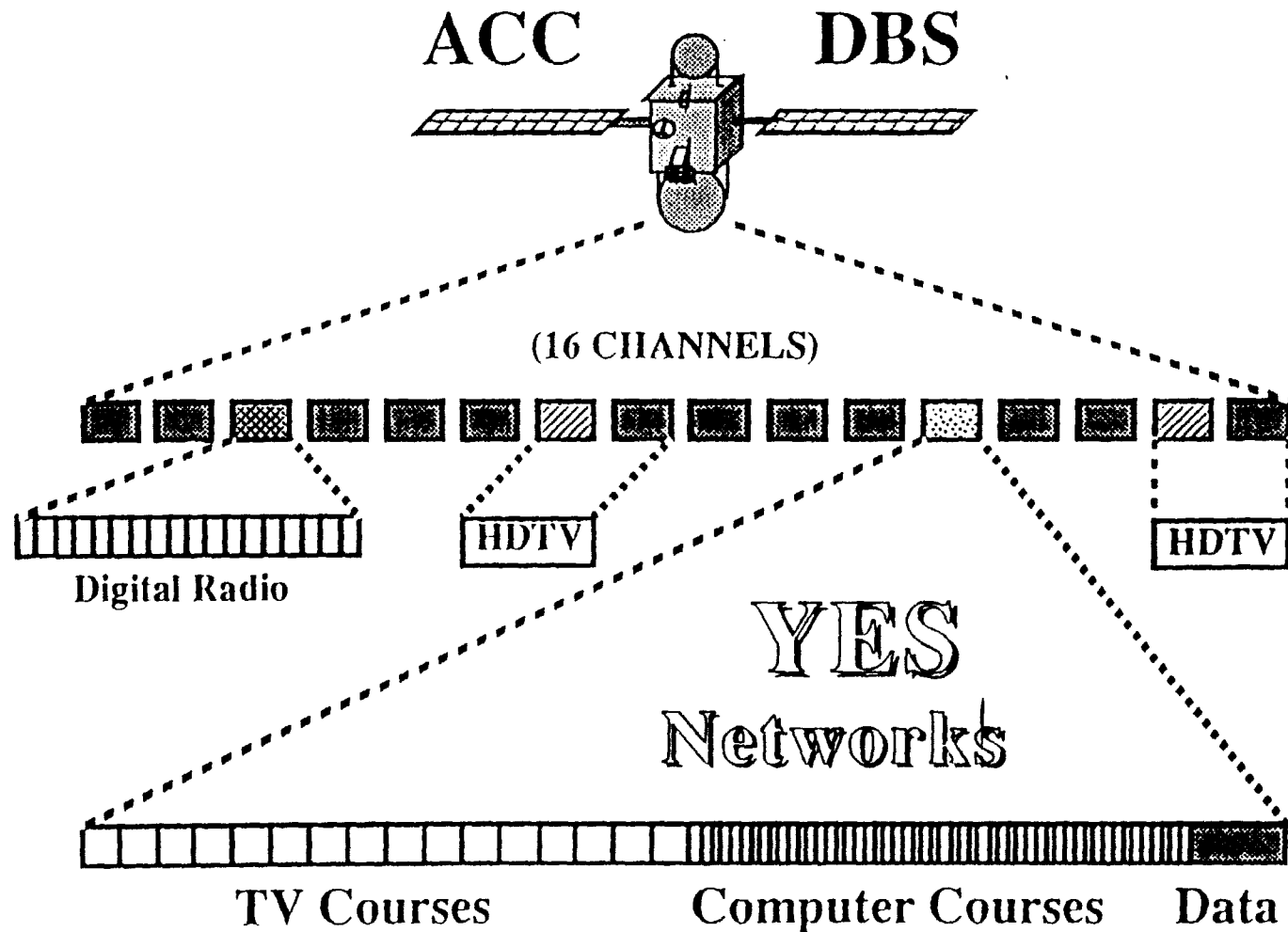


Stereo





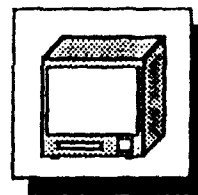
# Satellite Channelization



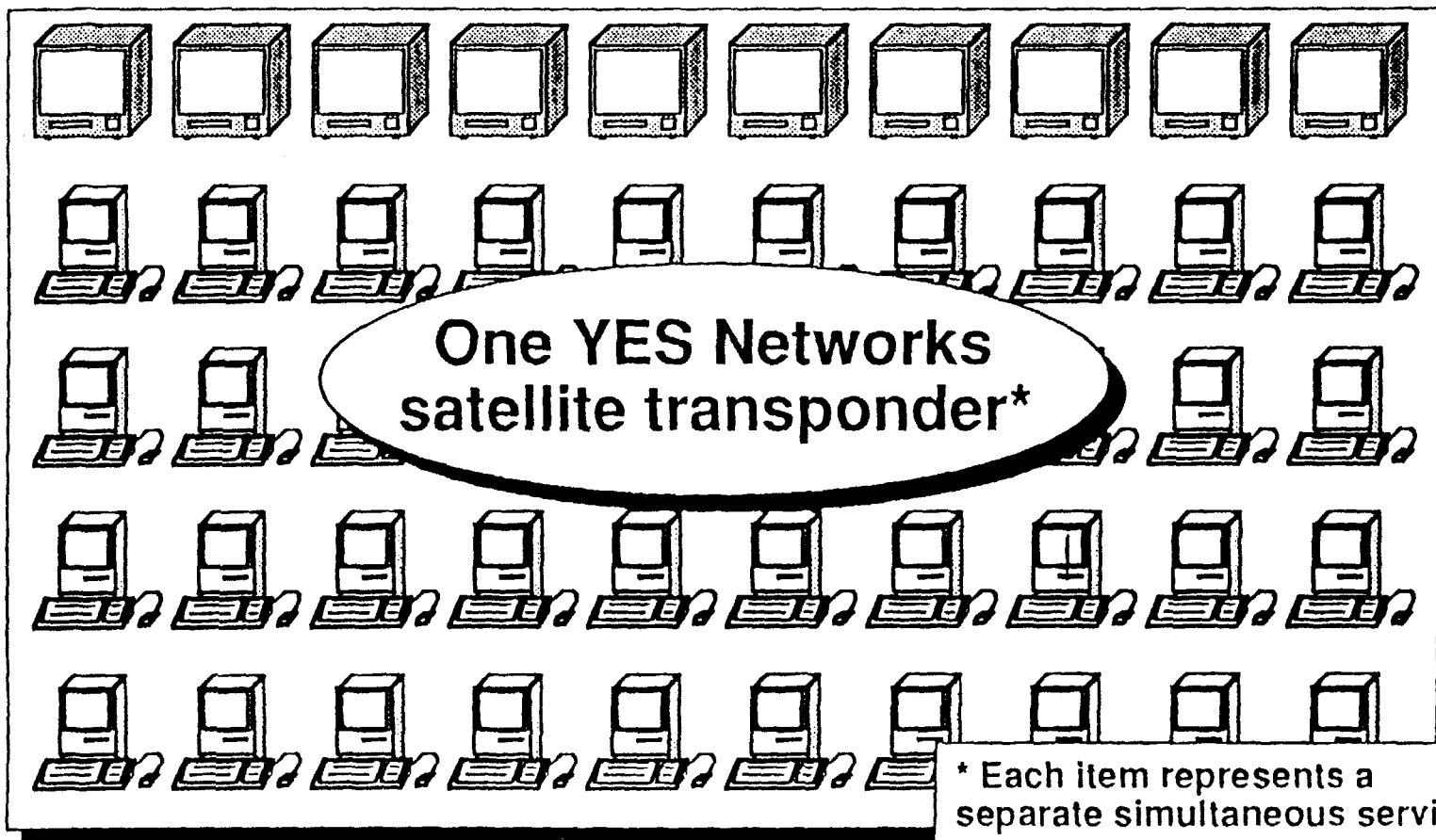


# YES Networks Service Comparison

One  
satellite transponder  
today



**VS:**

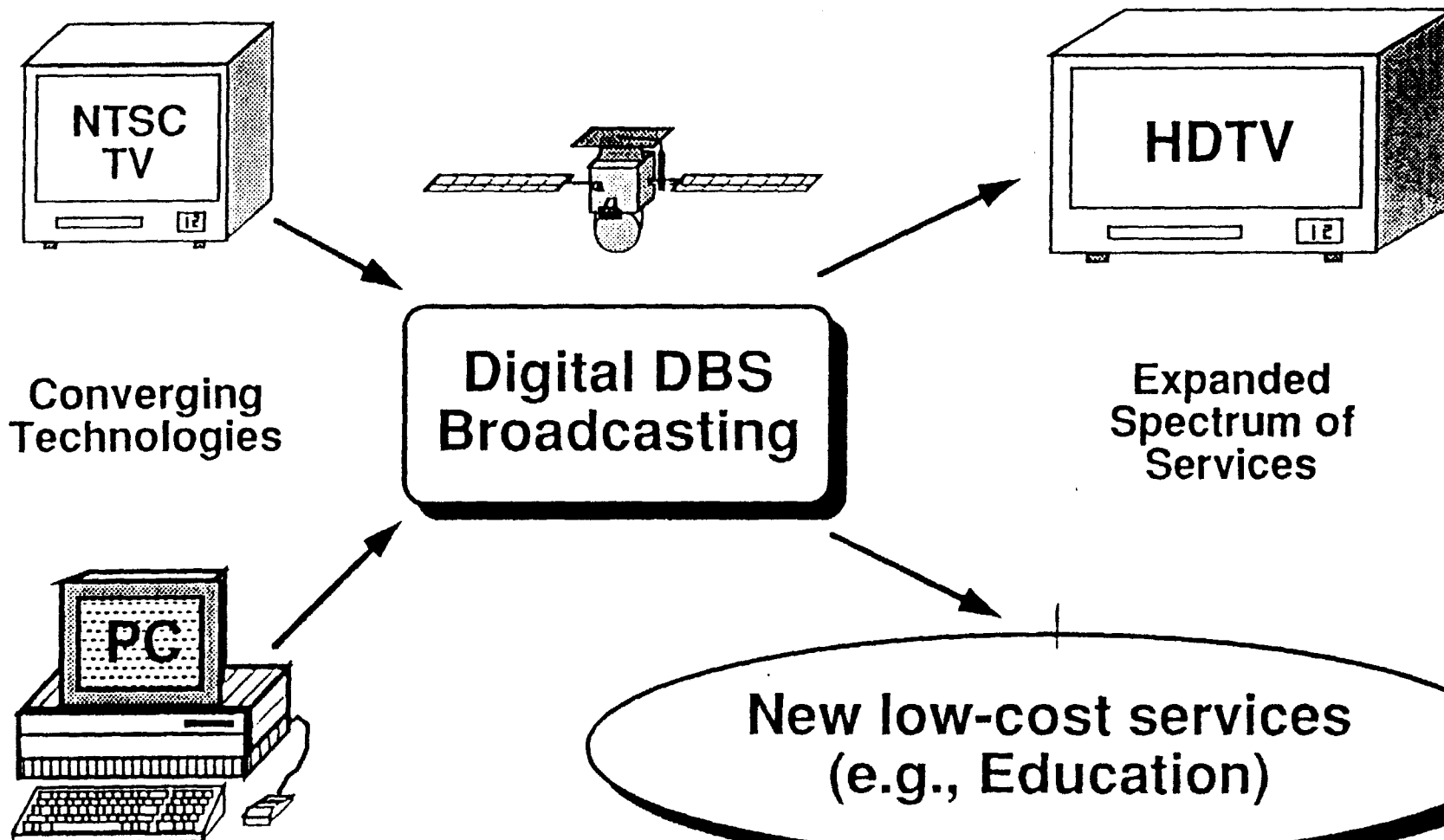


\* Each item represents a  
separate simultaneous service

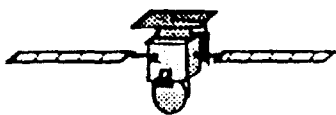
Advanced Communications Engineering, Inc.



# Converging Technologies: Expanded Services



Advanced Communications Engineering, Inc.



# Types of Services

## PUBLISHING

- Books
- Magazines
- Newspapers
- Shopping
- Trade Mags.
- Research
- ?

## TV

- Subscriber
- Commercial
- Educational
- Advanced
- High Def.
- New (3D?)

## COMPUTING

- New SW
- Games
- Demos
- SW Updates
- Shareware
- User Groups
- ?

## EDUCATIONAL

- Class Lectures
- Reading Materials
- Course Planning
- Teacher Ed.
- Prog. Learning
- Home Study
- Movies
- Exams
- Ref. Materials
- Adult Ed.
- Supp. Aids
- ?

## RADIO

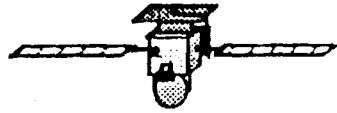
- Voice
- Local Ads
- Specialized
- CD Stereo
- Record Dist.

## DATA

- Weather
- Markets
- Inventory
- Catalogs
- ?

## NEW

?



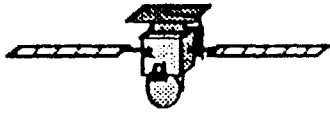
# The Future is Digital

- Advantages in noise and distortion.
- New media are available for digital services (light fibers, DBS, recordable Compact Disks, Digital Audio Tape).
- Digital demodulator chips are now economically feasible.
- Digital signal processing is maturing and becoming economically feasible.
- Digital Transmission offers a flexibility of services that is unprecedented.



# Flexibility is the Key

- A bit is a bit-- A lot of bits is anything you want it to be.
- Multiple services can be multiplexed statically or dynamically.
- Hard encryption can provide highly effective subscriber access control.
- Future service enhancements can easily be added.
- Totally new services can easily be initiated.



# HDTV and Computers

- All proposed HDTV systems require at least partial digital transmission.
- Digital DBS can easily be made compatible with any proposed HDTV system.
- All proposed HDTV systems require large amounts of digital memory, a substantial amount of digital signal processing, and sophisticated programmable control.
- Personal computers are rapidly moving into desk-top video, have high-resolution displays, are using signal processors, and have television interfaces.
- The technology is the same.

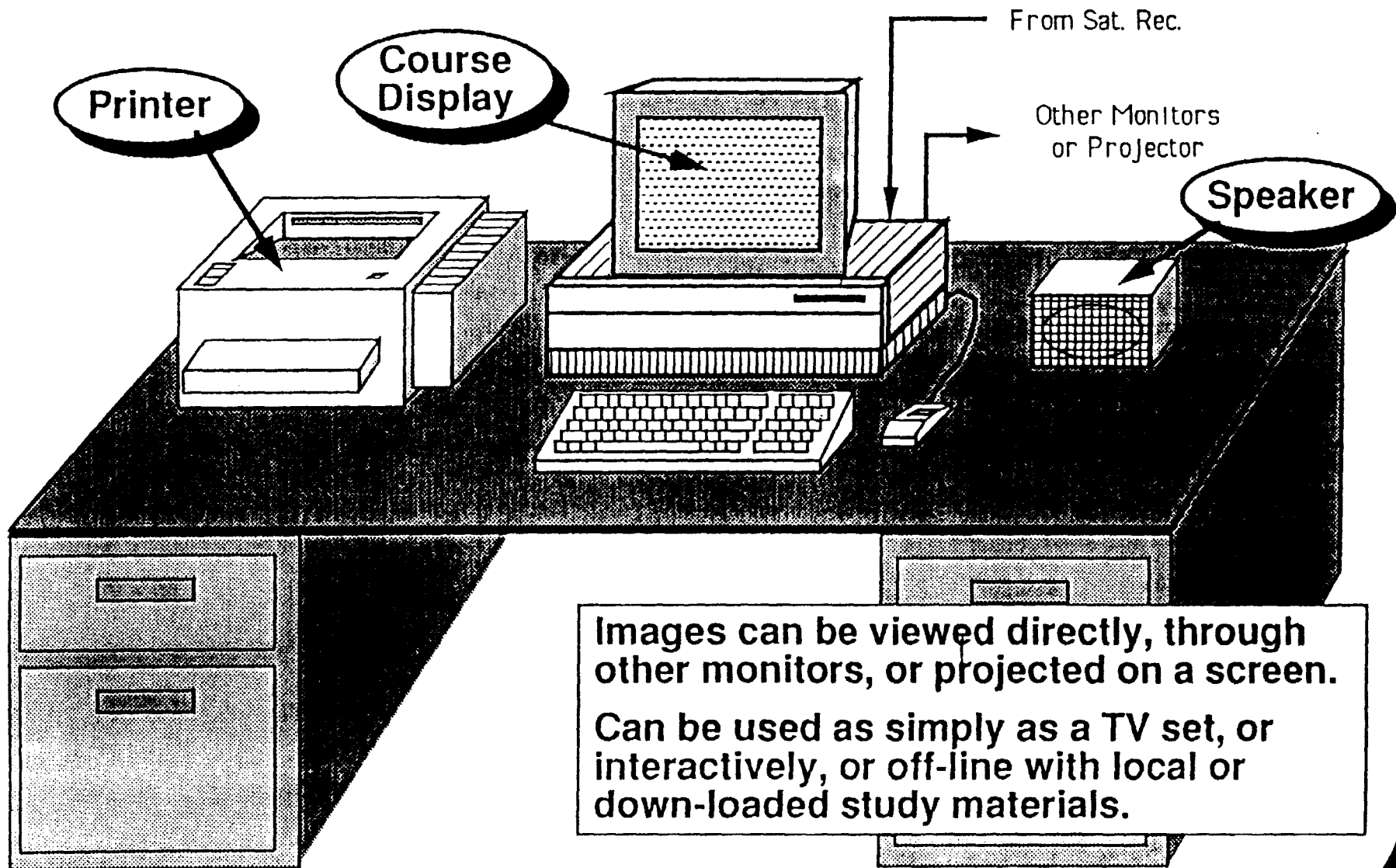


# Conclusion

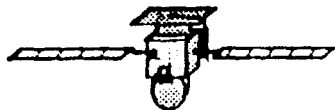
- Digital DBS is the solution.
  - Compatible HDTV.
  - Educational broadcasting services.
  - Other new broadcasting services.
- This is potentially a \$100 B / year industry.
- Digital DBS offers a unique opportunity for the United States to reestablish its leadership in commercial electronic technologies.



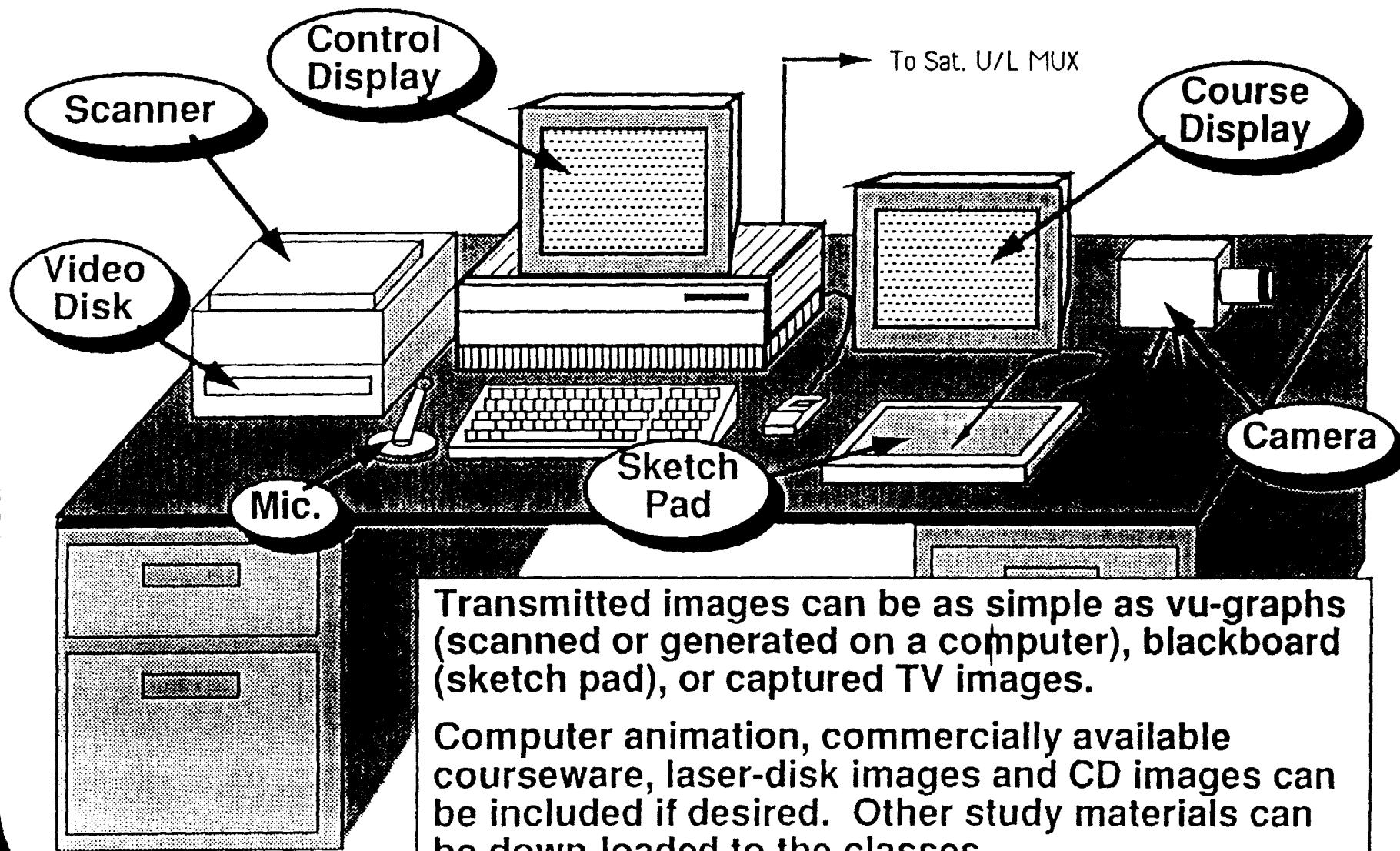
# School Station



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# Teacher Station



Transmitted images can be as simple as vu-graphs (scanned or generated on a computer), blackboard (sketch pad), or captured TV images.

Computer animation, commercially available courseware, laser-disk images and CD images can be included if desired. Other study materials can be down-loaded to the classes.

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